

Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP)

A Technical Working Document Annex to ERAMMP Report-12

ERAMMP Report-48: Predicting the Consequences of Possible Post-Brexit Scenarios on Bird Abundances in Wales

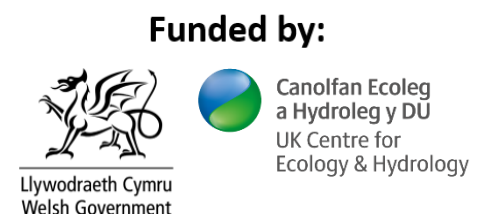
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Abbreviations Used in this Report

BBS	BTO/JNCC/RSPB Breeding Bird Survey
BTO	British Trust for Ornithology
CI	Confidence Interval
DA	Disadvantaged Area
Defra	Department for Environment, Food and Rural Affairs
EFT	ERAMMP Farm Type
ERAMMP	Environment and Rural Affairs Monitoring & Modelling Programme
FTA	Free Trade Agreement
GIS	Geographical Information System
GMEP	Glastir Monitoring and Evaluation Programme
JNCC	Joint Nature Conservation Committee
LCM	Land Cover Map
LiDAR	Light Detection and Ranging
RSPB	Royal Society for the Protection of Birds
SDA	Severely Disadvantaged Area
UKCEH	UK Centre for Ecology & Hydrology
WCP	Woody Cover Product

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1 INTRODUCTION & METHODS

This technical annex explores predictions of the consequence of possible post-Brexit scenarios on bird abundance in Wales based upon models of BTO/JNCC/RSPB British Breeding Bird Survey (BBS) data. It forms part of the Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP) modelling work as can be found in ERAMMP Report-12 'Quick Start' Modelling (Phase 1)¹.

1.1 Breeding Bird Survey (BBS)

The BTO/JNCC/RSPB Breeding Bird Survey (BBS) is a UK-wide survey that has been running since 1994, with the aim of monitoring population trends of the UK's breeding birds. The survey is organised by the British Trust for Ornithology (BTO) and carried out by volunteers. Participants in the BBS count all bird species seen or heard along two parallel 1km transects within randomly-allocated 1km grid squares (chosen through random sampling, stratified by observer density). Here, we used the maximum annual count of each species per 1km grid square in Wales over a five year period (2013 – 2017), having first extracted the maximum count across visits within years) to provide a best estimate of contemporary local abundance. We chose a five year period because it provided a good amount of grid squares with BBS data, whilst remaining up-to-date.

A compromise between a short time window (minimising real population change in the focal squares) and a longer window (increasing sample size due to turnover in the sample) was important. Considering multiple years compensated for the high stochasticity in counts of all species and detection of scarcer species from the BBS method, so reduced stochastic fluctuations between squares. For analysis, we only chose species that were present in at least 30 grid squares that also contained scenario data (described below). We chose a 30-square threshold because this is a standard for producing bird trends using BBS data (e.g. Harris et al. 2018). The abundances of 58 species were predicted using this threshold.

1.2 Geographical Information System (GIS) analysis

We used various datasets to calculate the amount of different land-uses per 1km grid square, matching the variables used in generating scenarios (see below) and adding contextual variables (not subject to change under the scenarios) as were considered important, from expert judgement and subject to data availability, for accurate prediction of bird abundance. We used the Detailed River Network, a spatial dataset produced by the Environment Agency², to calculate the total length of rivers per 1km grid square in Wales.

The Land Cover Map 2015 is a dataset produced by the UK Centre for Ecology & Hydrology (UKCEH) that used satellite imagery to map habitats based on Biodiversity Action Plan Broad Habitats for the whole of the UK (Rowland et al. 2017). We used the LCM2015 to calculate the proportion of each 1km grid square to contain different land-uses.

¹ www.erammp.wales/12

² <https://data.gov.uk/dataset/54d0c6b0-7bdc-4f66-90e7-42443b122c2e/detailed-river-network-afa036>

We chose broad habitats that were widespread (so potentially influential for national populations of birds) and that were not conflicted by other datasets used (e.g. we did not calculate the area for woodland because this would be covered by the Woody Cover Product).

The Woody Cover Product (WCP) is a dataset produced by UKCEH that used a combination of airborne radar data, satellite imagery and data from the National Forest Inventory to map large hedgerows, individual trees and small patches of woodland for the entirety of Wales. The area (ha) of each polygon was calculated by converting the raster data set to a vector data set (using the 'raster to polygon' tool in ArcMap) and using the 'calculate geometry' tool.

The Forestry Commission's definition of a woodland is at least 0.5 ha of a stand of trees³, so we selected all polygons with an area of at least 0.5 ha. The proportion of each 1km grid square to contain woodland were then calculated. The level of afforestation (i.e. the change in woodland cover) for different Brexit scenarios (described below) were calculated and provided by UKCEH.

Finally, we used the Robust Farm Type spatial dataset provided by UKCEH that has classified farming types in Wales at the field level. The Farm types include: cereals, general cropping, dairy, lowland cattle/sheep, mixed, specialist sheep, specialist beef, various grazing in disadvantaged areas (DAs) and mixed grazing in Severely Disadvantaged Areas (SDAs). The proportion of each of these per 1km was calculated using GIS. All GIS analyses were conducted using ArcMap version 10.5.1.

1.3 Predictive modelling

Under different scenarios for post-Brexit land-use, the amounts of some of the farm types are predicted to change, as well as the level of afforestation. These scenarios can be found in ERAMMP Report-12 'Quickstart Modelling (Phase 1)'⁴.

We first fitted generalised linear models with Poisson error structures to BBS bird count data to predict the abundance of bird species under three different Brexit scenarios: 'no deal', 'EU deal' and 'Free Trade Agreement (FTA)'. The maximum count of the species per 1km grid square was fitted as the response variable. Fixed effects included the different land-uses and field types per 1km square: total length of rivers, and proportion of acid grassland, heather, suburban habitat, urban habitat, woodland cover, cereals, general cropping, dairy, lowland cattle/sheep, mixed, specialist sheep, specialist beef, DA various grazing and SDA mixed grazing. Once these baseline models were fit, predictions on how abundance might change under different scenarios were conducted using the *predict* function in R, using datasets containing the changed amounts of the farm types and afforestation.

This method predicted counts per 1km square under each scenario. The total count across all grid squares was then calculated so comparisons between the baseline data and the different scenarios could be made. Models were fitted for each species separately. Predictions were made for BBS squares alone, and also for all squares in Wales. Just using squares with BBS data means that the results are more precise and that predictions are not made outside the range of the data, at least spatially, but only provides predictions for a small proportion of

³<https://data.gov.uk/dataset/ae33371a-e4da-4178-a1df-350ccfcc6cee/national-forest-inventory-woodland-england-2015>

⁴ www.erammp.wales/12

Wales. Using all 1km grid squares makes results formally less reliable but does provide predictions for the whole of Wales.

Once the predicted abundance of each species under the three different scenarios was calculated, the diversity of species under each scenario was calculated using Simpson's Diversity Index, where n is the number of individuals of each species and N is the total number of all individuals:

$$D = 1 - \frac{\sum n(n-1)}{N(N-1)}$$

The mean species diversity across all 1km grid squares in Wales, along with 95% confidence intervals, is presented. The mean diversity of species is compared among the different scenarios using ANOVA tests and post-hoc Tukey's test. Predicted abundance and species diversity under the different Brexit scenarios are reported for species listed as 'woodland' ($n = 25$), 'farmland' ($n = 9$), 'water and wetland' ($n = 5$) or 'other' ($n = 15$; i.e. those not included in any of the other indicator lists) species as reported in Defra's wild bird indicator document (Defra, 2017). The level of conservation concern ('amber' or 'red') of each species is also provided (Eaton et al. 2015).

2 RESULTS

2.1 Basic model results

The full model results for each species are shown in Annex-1; the percentage of species to show a significant positive or negative effect of the different land-uses and farm types are summarised here.

The abundance of more than half of farmland species was positively affected by mixed farm types and freshwater habitats. There was a negative effect of acid grassland, SDA mixed, specialist beef and specialist sheep on the abundance of the majority of farmland species. The abundance of all nine farmland species was negatively affected by forest cover (Table 2.1; Table 4.1).

The abundance of most woodland species was negatively affected by the amount of acid grassland and heather grassland. Conversely, the abundance of most woodland species was positively affected by the amount of forest cover (Table 2.1; Table 4.2).

The abundance of all five water and wetland species was negatively affected by dairy farm types and forest cover, and positively affected by cereal farms. The abundance of the majority of water and wetland species was negatively affected by heather grassland, SDA mixed, specialist beef and urban habitat (Table 2.1; Table 4.3).

The abundance of most 'other' species was positively affected by mixed farm types, but negatively affected by general cropping (Table 2.1; Table 4.4).

Table 2.1. The percentage of farmland (n = 9), woodland (n = 25), water and wetland (n = 5) and other (n = 15) species where there was a significant positive or negative effect of the various land-uses and farm types on abundance.

	Farmland		Woodland		Water and wetland		Other	
	% Positive	% Negative	% Positive	% Negative	% Positive	% Negative	% Positive	% Negative
Acid grassland	11	89	20	80	40	60	33	67
Cereals	22	78	56	44	100	0	40	60
DA various	22	78	44	56	40	60	53	47
Dairy	22	78	28	72	0	100	40	60
Woodland	0	100	84	16	0	100	27	73
Freshwater	56	44	64	36	40	60	40	60
General cropping	22	78	28	72	60	40	13	87
Heather	33	67	16	84	20	80	60	40
Lowland cattle & sheep	44	56	48	52	40	60	53	47
Mixed	67	33	64	36	40	60	80	20
River length	22	78	68	32	80	20	53	47
SDA mixed	11	89	48	52	20	80	60	40
Specialist beef	11	89	40	60	20	80	40	60
Specialist sheep	11	89	40	60	60	40	60	40
Suburban	44	56	44	56	60	40	33	67
Urban	33	67	24	76	20	80	27	73

2.2 Predicted abundance of species under different Brexit scenarios

Using models based on all 1km squares in Wales, the abundance of all farmland species, apart from greenfinch (*Carduelis chloris*), was predicted to be higher in all Brexit scenarios compared to the baseline level. This included three specialist red-listed species: linnet (*Linaria cannabina*), skylark (*Alauda arvensis*) and starling (*Sturnus vulgaris*). Indeed, starling had the highest predicted increase in abundance under all three scenarios. The abundance of greenfinch was predicted to be lower than the baseline under all scenarios (Table 2.2). Findings were similar using BBS squares only, with the addition of a model for stock dove (*Columba oenas*), for which predictions beyond the BBS dataset on which it was built were clearly unreliable. In models using BBS squares only, the abundance of greenfinch was higher than the baseline under the Brexit scenarios (Table 4.5).

Table 2.2. Predicted abundance and the percentage difference in predicted abundance from the baseline for farmland species in Wales under three different scenarios of Brexit. Blue and green shading illustrates a percentage increase and decrease, respectively, in abundance of at least 1% from the baseline. Abundances are estimated using all 1km grid squares in Wales. N = number of 1km squares that had BBS and scenario data.

Species	Generalism/ specialism	List	Baseline			No deal			EU Deal			FTA		
			N	Predicted abundance		N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)
Greenfinch	Generalist		227	94,874		219	91,282	-4%	219	89,884	-5%	227	92,526	-2%
Jackdaw	Generalist		279	347,856		273	382,080	10%	273	381,329	10%	279	376,498	8%
Rook	Generalist		167	307,471		164	386,870	26%	164	380,927	24%	167	377,469	23%
Woodpigeon	Generalist		361	227,055		352	235,478	4%	352	231,015	2%	361	236,004	4%
Goldfinch	Specialist		315	160,021		308	171,105	7%	308	169,997	6%	315	168,831	6%
Linnet	Specialist	Red	212	165,030		206	177,342	7%	206	191,540	16%	212	181,233	10%
Skylark	Specialist	Red	213	242,613		207	264,026	9%	207	260,271	7%	213	272,370	12%
Starling	Specialist	Red	147	209,813		142	275,268	31%	142	272,533	30%	147	269,376	28%
Whitethroat	Specialist		225	94,178		220	98,340	4%	220	104,561	11%	225	103,791	10%

Using models based on all 1km squares in Wales, the predicted abundances of nine of 25 woodland species were at least 1% higher than the baseline under a 'no deal' scenario, including two amber-listed species. The abundance of 12 woodland species, including three amber-listed species and three red-listed species, was predicted to be at least 1% lower than the baseline under a 'no deal' scenario. The abundances of tree pipit (*Anthus trivialis*) and nuthatch (*Sitta europaea*) were predicted to be more than 20% lower under a 'no deal' scenario compared to the baseline (Table 2.3). Predicted abundances of woodland species were similar under an 'EU deal' to a 'no deal' scenario, though redstart (*Phoenicurus phoenicurus*) abundance was predicted to be 3% higher than the baseline under an 'EU deal' (Table 2.3). The abundances of 16 woodland species were predicted to be higher, and the abundances of eight species were predicted to be lower, than the baseline under an 'FTA' scenario. The abundance of spotted flycatcher, a red-listed specialist woodland species, was particularly lower under an 'FTA' scenario compared to the baseline or the other two Brexit scenarios (Table 2.3).

Using models based on BBS squares only, the abundance of the vast majority of woodland species was predicted to be lower than the baseline under all three scenarios. However, the abundances of dunnock (*Prunella modularis*) and long-tailed tit (*Aegithalos caudatus*) were predicted to be higher than the baseline under all scenarios (Table 4.6).

Table 2.3. Predicted abundance and the percentage difference in predicted abundance from the baseline for woodland species in Wales under three different scenarios of Brexit. Blue and green shading illustrates a percentage increase and decrease, respectively, in abundance of at least 1% from the baseline. Abundances are estimated using all 1km grid squares in Wales. N = number of 1km squares that had BBS and scenario data.

Species	Generalism/ specialism	List	Baseline		No deal			EU deal			FTA		
			N	Predicted abundance	N	Predicted abundance	Difference from baseline	N	Predicted abundance	Difference from baseline	N	Predicted abundance	Difference from baseline
Blackbird	Generalist		380	345,856	371	347,861	1%	371	349,324	1%	380	358,520	4%
Blue tit	Generalist		349	223,432	341	223,093	0%	341	227,272	2%	349	226,667	1%
Bullfinch	Generalist	Amber	207	59,294	201	59,731	1%	201	58,954	-1%	207	61,625	4%
Chaffinch	Generalist		373	328,228	364	335,086	2%	364	342,587	4%	373	334,294	2%
Dunnoch	Generalist	Amber	351	130,209	343	147,041	13%	343	141,715	9%	351	140,938	8%
Great tit	Generalist		353	142,668	345	142,358	0%	345	146,021	2%	353	149,726	5%
Long-tailed tit	Generalist		210	86,329	203	85,236	-1%	203	85,179	-1%	210	85,616	-1%
Robin	Generalist		370	242,354	361	251,334	4%	361	250,224	3%	370	255,559	5%
Song thrush	Generalist	Red	353	103,528	344	97,331	-6%	344	97,944	-5%	353	107,570	4%
Tawny owl	Generalist	Amber	31	27,707	30	26,604	-4%	30	27,339	-1%	31	27,799	0%
Wren	Generalist		385	318,443	376	330,482	4%	376	323,425	2%	385	335,141	5%
Blackcap	Specialist		306	97,494	297	104,559	7%	297	99,127	2%	306	107,731	11%
Chiffchaff	Specialist		334	116,361	326	110,310	-5%	326	110,298	-5%	334	113,160	-3%
Coal tit	Specialist		213	50,922	208	48,197	-5%	208	46,365	-9%	213	55,000	8%
Garden warbler	Specialist		165	46,407	159	42,628	-8%	159	42,855	-8%	165	43,684	-6%
Goldcrest	Specialist		236	63,694	230	62,565	-2%	230	60,489	-5%	236	68,435	7%
Great spotted woodpecker	Specialist		266	44,600	258	46,412	4%	258	46,833	5%	266	47,757	7%
Green woodpecker	Specialist		125	30,843	123	28,616	-7%	123	28,936	-6%	125	28,865	-6%
Jay	Specialist		225	42,784	220	42,818	0%	220	42,661	0%	225	43,739	2%
Nuthatch	Specialist		214	77,404	210	60,627	-22%	210	62,325	-19%	214	64,496	-17%
Redstart	Specialist	Amber	193	83,456	190	77,923	-7%	190	85,881	3%	193	81,020	-3%
Spotted flycatcher	Specialist	Red	81	529,479	80	511,612	-3%	80	511,619	-3%	81	392,236	-26%
Tree pipit	Specialist	Red	103	97,291	100	73,816	-24%	100	74,502	-23%	103	82,165	-16%
Treecreeper	Specialist		150	35,639	148	37,229	4%	148	37,135	4%	150	36,983	4%
Willow warbler	Specialist	Amber	334	158,346	325	151,136	-5%	325	151,075	-5%	334	160,466	1%

Using models based on all 1km squares in Wales, the abundance of two of the five water and wetland species was predicted to be higher, and the abundance of three of the five was predicted to be lower, than the baseline under a 'no deal' scenario.

The abundance of three and two water and wetland species was predicted to be higher and lower, respectively, under both 'EU deal' and 'FTA' scenarios. Notably, the abundance of sedge warbler (*Acrocephalus schoenobaenus*) was predicted to be 43 – 70% higher than the baseline compared to the three Brexit scenarios, though sample sizes were small for this (and other) species (Table 2.4).

Findings were broadly similar using only BBS squares, with the addition of a model for moorhen that appeared unreliable when predicting beyond the BBS sample. Predicted abundances of reed bunting (*Emberiza schoeniclus*), sedge warbler and moorhen (*Gallinula chloropus*) were all particularly higher than the baseline under all Brexit scenarios (Table 4.7).

Table 2.4. Predicted abundance and the percentage difference in predicted abundance from the baseline for water and wetland species in Wales under three different scenarios of Brexit. Blue and green shading illustrates a percentage increase and decrease, respectively, in abundance of at least 1% from the baseline. Abundances are estimated using all 1km grid squares in Wales. N = number of 1km squares that had BBS and scenario data.

Species	Generalism/ specialism	List	Baseline		No deal			EU deal			FTA		
			N	Predicted abundance	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)
Dipper	Fast flowing water	Amber	46	38,290	46	33,713	-12%	46	36,312	-5%	46	34,796	-9%
Reed bunting	Reedbeds	Amber	91	59,007	89	73,159	24%	89	77,352	31%	91	76,650	30%
Sedge warbler	Reedbeds		58	174,140	56	295,441	70%	56	249,655	43%	58	277,741	59%
Mallard	Slow & standing water	Amber	158	109,780	155	94,278	-14%	155	105,315	-4%	158	104,124	-5%
Grey heron	Other		74	30,098	71	29,387	-2%	71	34,276	14%	74	32,583	8%

Using models based on all 1km squares in Wales, the abundance of nine of the 15 species not listed as indicator species was predicted to be at least 1% higher than the baseline under a 'no deal' scenario, three of which are red-listed species. Notably, the abundance of whinchat (*Saxicola rubetra*) was predicted to be 55% higher under a 'no deal' scenario compared to the baseline, and was higher than any of the other scenarios.

The abundance of five species, including one amber-listed species, was predicted to be lower than the baseline under a 'no deal' scenario (Table 2.5). The abundance of 12 species was predicted to be at least 1% higher than the baseline under an 'EU deal' scenario, including four red-listed species and one amber-listed species. The abundance of three species was predicted to be at least 1% lower under an 'EU deal' (Table 2.5).

The predicted abundances of 'other' species were similar in an 'FTA' scenario to an 'EU deal' scenario; though the abundance of pheasant (*Phasianus colchicus*) and whinchat were slightly lower (Table 2.5). Findings were broadly similar when using BBS squares only, though the abundances of cuckoo (*Cuculus canorus*) and grasshopper warbler (*Locustella naevia*), both red-listed species, were predicted to be lower under all three scenarios compared to the baseline (Table 4.8).

Table 2.5. Predicted abundance and the percentage difference in predicted abundance from the baseline for species not listed as habitat indicators in Wales under three different scenarios of Brexit. Blue and green shading illustrates a percentage increase and decrease, respectively, in abundance of at least 1% from the baseline. Abundances are estimated using all 1km grid squares in Wales. N = number of 1km squares that had BBS and scenario data.

Species	List	Baseline			No deal			EU deal			FTA		
		N	Predicted abundance		N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)
Buzzard		296	42,041		291	38,470	-8%	291	39,716	-6%	296	38,682	-8%
Canada goose		85	235,887		83	229,035	-3%	83	224,054	-5%	85	233,590	-1%
Carrion crow		378	338,935		371	354,578	5%	371	374,744	11%	378	344,482	2%
Collared dove		184	106,429		178	140,704	32%	178	134,191	26%	184	137,802	29%
Cuckoo	Red	169	36,181		164	36,077	0%	164	37,485	4%	169	37,585	4%
Grasshopper warbler	Red	57	42,407		57	42,628	1%	57	42,855	1%	57	43,684	3%
House sparrow	Red	275	429,730		269	531,548	24%	269	474,316	10%	275	484,452	13%
Magpie		319	137,728		313	142,406	3%	313	143,695	4%	319	140,354	2%
Meadow pipit	Amber	220	310,323		215	293,222	-6%	215	326,564	5%	220	296,732	-4%
Pheasant		250	108,738		245	95,629	-12%	245	102,735	-6%	250	102,580	-6%
Pied wagtail		308	69,792		299	73,793	6%	299	76,095	9%	308	71,587	3%
Stonechat		133	70,922		130	69,782	-2%	130	76,216	7%	133	73,288	3%
Swallow		269	169,656		263	173,440	2%	263	173,897	2%	269	172,210	2%
Wheatear		170	92,823		165	103,977	12%	165	115,481	24%	170	103,243	11%
Whinchat	Red	52	79,318		51	122,575	55%	51	82,140	4%	52	78,574	-1%

Overall, the numbers of species with predicted abundances higher than the baseline under all three scenarios were slightly higher when using all 1km squares in Wales than with BBS squares only (Table 2.6). However, the predicted abundance of more species was higher under an 'EU deal', followed by an 'FTA' scenario, compared to a 'no deal'. In other words, it is predicted that an 'FTA' scenario would produce the most positive outcome for bird abundances compared to the other scenarios.

When using models based on BBS squares only, the predicted abundance of species to have a higher and lower abundance than the baseline under the three different scenarios were similar (Table 2.6).

Table 2.6. The number of species to have a predicted change in abundance of over 1% below or above the baseline under three different scenarios of Brexit. Results are shown for models conducted using all 1km squares in Wales, and BBS squares only. Percentages are calculated using the total number of species (all squares: n = 54; BBS squares only: n = 56).

% difference from baseline	Scenario		
	No deal	EU deal	FTA
<i>All 1km squares</i>			
> +1%	28 (52%)	34 (63%)	37 (69%)
< -1%	22 (41%)	19 (35%)	16 (30%)
<i>BBS squares only</i>			
> +1%	26 (46%)	27 (48%)	27 (48%)
< -1%	29 (52%)	28 (50%)	27 (48%)

2.3 Predicted species diversity under different Brexit scenarios

The diversity of species was similar between the three different Brexit scenarios and the baseline for most groups. When considering all species, diversity was significantly different between all of the scenarios; diversity was highest in an 'FTA' scenario, followed by 'no deal', 'EU deal' and the baseline (ANOVA: $f_{(3,26554)} = 100.3$, $p < 0.001$; Table 2.7). Diversity of farmland birds was significantly higher in the baseline compared to the 'no deal', 'deal' or 'FTA' scenarios, and was significantly higher in an 'EU deal' scenario compared to a 'no deal' scenario (ANOVA: $f_{(3,26554)} = 23.7$, $p < 0.001$; Table 2.7). Diversity of woodland bird species as significantly different between all scenarios apart from a 'no deal' and 'EU deal' scenario, where diversity was the highest; diversity of woodland birds was lowest using the baseline data (ANOVA: $f_{(3,26554)} = 239.4$, $p < 0.001$; Table 2.7). Diversity of water and wetland birds was significantly different between all scenarios apart from an 'FTA' scenario and the baseline, where diversity was the highest; diversity of water and wetland birds was lowest in the 'no deal' scenario, followed by and 'EU deal' (ANOVA: $f_{(3,26554)} = 259.1$, $p < 0.001$; Table 2.7). Diversity of 'other' species was significantly different between all scenarios apart from a 'no deal' and 'EU deal' scenario. Diversity of other species was lowest using the baseline data and highest in the 'FTA' scenario (ANOVA: $f_{(3,26554)} = 266.9$, $p < 0.001$; Table 2.7). It must be noted that all differences are marginal, and only species where abundance could be predicted (i.e. those that were present in at least 30 squares) were used in diversity indices, so indices do not take in to account rarer species, which could alter the patterns observed and may be particularly important for conservation interpretation.

Table 2.7. Mean Simpson's Diversity Index of different bird groups for each of the different scenarios of Brexit using all 1km squares in Wales. The closer the value is to 1 the higher the species diversity. Numbers in brackets show upper and lower confidence intervals.

Habitat group	Scenario			
	Baseline	No deal	EU deal	FTA
All species	0.910 (0.913,0.908)	0.932 (0.934,0.930)	0.926 (0.928,0.923)	0.937 (0.939,0.935)
Farmland	0.844 (0.845,0.843)	0.835 (0.836,0.833)	0.837 (0.839,0.836)	0.836 (0.838,0.835)
Woodland	0.897 (0.899,0.895)	0.923 (0.924,0.921)	0.923 (0.924,0.921)	0.919 (0.920,0.918)
Water and wetland	0.757 (0.759,0.755)	0.717 (0.719,0.714)	0.741 (0.743,0.739)	0.759 (0.761,0.756)
Other	0.813 (0.815,0.810)	0.839 (0.841,0.838)	0.836 (0.839,0.834)	0.856 (0.857,0.854)

3 DISCUSSION

These summary findings in note form should be seen as part of a broader discussion of the various scenarios and their effects on multiple targets.

- In general, the predicted abundance of the majority of species was highest under an 'FTA' or 'EU deal' scenario (Table 2.6), although this was marginal for most species and, when considering abundances by indicator groups, findings were broadly similar across all scenarios. Apart from a small number of species (e.g. sedge warbler, starling, whinchat), predicted changes in national abundance and diversity in Wales are generally small under all scenarios, which probably reflects the fact that species presence and abundance are more sensitive to gross landscape features such as cover of woodland, urban or water, than to field contents and management in agricultural systems (Siriwardena et al. 2012).
- All land-use changes are likely to benefit some species and to have negative effects on others. The results reflect this and underline that it is simplistic to refer to such changes as being "good" or "bad" for wildlife or biodiversity in general. Moreover, there are likely to be other effects of Brexit on wildlife that are not directly linked to changes in farm types; for example, following Brexit, some environmental legislation may be lost or weakened (e.g. implementation of legislation through agreements such as RAMSAR and the Habitats Directive)⁵. As such, results presented here only provide very crude predictions.
- Diversity indices reflect patterns of relative abundance across species and can be increased by increases or reductions in particular component species, depending upon their initial dominance within the community. In addition, a lack of change in an index can mask turnover of component species whereby the balance of numerical abundances in an area changes less than the abundances of individual species. These points need to be considered while interpreting diversity index results.
- The abundance and diversity estimates in this study are derived from raw BBS count data, which describe relative abundances within species and are not, strictly, comparable between species. This is because species vary in their detectability, both absolutely and in respect of the variation in detectability with distance from the observer. Hence, the estimates of bird population sizes provided do not represent total numbers but, rather, numbers detectable from BBS transect surveys through a 1km square. This means that populations of more cryptic or quieter species, those with less detectable females and those found in habitats with poorer visibility and/or around transmission will have been under-estimated. However, given that most species are consistent in terms of habitat selection and the proportion of their populations that is detected can be assumed to be constant, this under-estimation will not cause bias in estimates of population change. It does, however, mean that the diversity indices that have been calculated here should only be regarded as indicative, because they depend upon estimates of absolute numbers, which are not equivalent between species (for example, a count of four mute swans is more likely to be close to the real, total number present than a count of four wrens, which is likely to reflect four singing males and an unknown number of females and birds that were more distant and not detected). Further work could attempt to address this issue by

⁵ Summary of EU Exit Scenario Planning Workshops: <https://gov.wales/docs/drah/publications/180219-summary-of-eu-exit-scenario-planning-workshops-en.pdf>

estimating absolute densities using distance analysis, which the BBS dataset supports, but it is important to note that this is not a panacea, as the method includes various assumptions that may not hold.

- In this study, woody cover was considered as a single variable, i.e. combining deciduous and coniferous woodland. This is likely to have caused considerable noise and uncertainty in the analyses, because coniferous woodland in Wales will comprise entirely non-native species with low biodiversity value, whereas deciduous woodland represents the indigenous vegetation (and natural climax community from natural succession) for most of the landscape, so is likely to provide considerable value for biodiversity. Hence, predicted bird responses scenarios increasing conifer cover are likely to be unrealistically positive for most species, while those with increased deciduous cover are likely to be unrealistically negative. Improved models in which conifer and broadleaf cover and their effects are separated will be developed in future modelling work under ERAMMP.

4 ANNEX-1: FULL MODEL RESULTS FOR EACH SPECIES

Table 4.1 Results from the Poisson GLMs testing the effects of various land-uses and farm types on the abundance of farmland species.

	Variable	Estimate	Std. Error	Z value	P value
Goldfinch	Acid grassland	-1.06914	0.15101	-7.07991	1.44E-12
	Freshwater	2.93168	0.512382	5.721671	1.05E-08
	Heather	0.876394	0.390825	2.242417	0.024934
	Suburban	-0.23247	0.162031	-1.4347	0.151372
	Urban	-0.59021	0.29138	-2.02556	0.04281
	River length	-1.85E-05	9.00E-06	-2.05926	0.039469
	Cereals	-0.84153	0.239238	-3.51756	0.000436
	General cropping	-0.61885	0.663698	-0.93242	0.351118
	Dairy	-0.44704	0.135815	-3.29151	0.000997
	Lowland cattle/sheep	0.31982	0.12677	2.522833	0.011641
	Mixed	1.018961	0.186691	5.458005	4.82E-08
	Specialist sheep	-0.57526	0.128329	-4.48269	7.37E-06
	Specialist beef	-0.06589	0.280233	-0.23514	0.814101
	SDA mixed	0.359949	0.151798	2.37123	0.017729
	DA various	-0.01156	0.115492	-0.10008	0.920278
	Woodland	-0.72813	0.136606	-5.33015	9.81E-08
Greenfinch	Acid grassland	-0.28265	0.322064	-0.87763	0.380143
	Freshwater	0.787243	0.855069	0.920678	0.357219
	Heather	2.465423	1.405349	1.754313	0.079377
	Suburban	0.126701	0.229146	0.552927	0.580313
	Urban	-0.65538	0.496017	-1.32129	0.186405
	River length	-5.91E-05	1.63E-05	-3.63392	0.000279
	Cereals	0.164969	0.308664	0.534461	0.593022
	General cropping	-0.83913	1.112931	-0.75398	0.45086
	Dairy	-0.37821	0.224334	-1.68592	0.09181
	Lowland cattle/sheep	0.024952	0.205612	0.121353	0.903411
	Mixed	-0.06936	0.355281	-0.19521	0.845227
	Specialist sheep	-0.62963	0.246068	-2.55875	0.010505
	Specialist beef	-0.4266	0.506488	-0.84227	0.399639
	SDA mixed	-0.21976	0.292081	-0.7524	0.451812
	DA various	-0.04533	0.19609	-0.23119	0.817166
	Woodland	-0.44318	0.224926	-1.97031	0.048803
Jackdaw	Acid grassland	-0.86564	0.100373	-8.62426	6.45E-18
	Freshwater	0.330797	0.571813	0.578505	0.562923
	Heather	-1.03161	0.498874	-2.06788	0.038651
	Suburban	1.423786	0.0806	17.66485	7.82E-70
	Urban	-2.22038	0.231153	-9.60569	7.56E-22
	River length	-1.05E-05	6.23E-06	-1.68876	0.091265
	Cereals	-1.5455	0.193547	-7.98513	1.40E-15
	General cropping	-2.68619	1.158634	-2.31841	0.020427
	Dairy	0.393092	0.084315	4.662187	3.13E-06
	Lowland cattle/sheep	0.154148	0.094669	1.628294	0.103462
	Mixed	0.421522	0.143435	2.938772	0.003295
	Specialist sheep	-0.22847	0.086294	-2.64754	0.008108
	Specialist beef	-1.18196	0.269944	-4.37855	1.19E-05
	SDA mixed	-0.21655	0.120552	-1.79633	0.072442
	DA various	-0.48528	0.087371	-5.55426	2.79E-08
	Woodland	-0.84902	0.117412	-7.23111	4.79E-13
Linnet	Acid grassland	-0.35169	0.123638	-2.84454	0.004448
	Freshwater	-3.14601	1.34538	-2.33838	0.019367
	Heather	-1.09069	0.314024	-3.47328	0.000514
	Suburban	0.368588	0.262537	1.403947	0.160335
	Urban	-2.84562	0.746169	-3.81364	0.000137
	River length	-0.00011	1.39E-05	-7.94018	2.02E-15
	Cereals	-0.55948	0.288747	-1.93762	0.052669
	General cropping	1.056225	0.61319	1.722509	0.084977
	Dairy	-0.13272	0.154116	-0.86116	0.389149
	Lowland cattle/sheep	-0.15586	0.190099	-0.81988	0.412285

	Variable	Estimate	Std. Error	Z value	P value
Rook	Mixed	0.49257	0.224216	2.196851	0.028031
	Specialist sheep	0.03687	0.132002	0.279313	0.780005
	Specialist beef	-2.13558	0.632956	-3.37398	0.000741
	SDA mixed	-0.08118	0.200704	-0.40448	0.685862
	DA various	0.380764	0.132686	2.869661	0.004109
	Woodland	-1.96405	0.214639	-9.15048	5.67E-20
	Acid grassland	-1.0825	0.147535	-7.33723	2.18E-13
	Freshwater	-5.86087	1.313099	-4.46339	8.07E-06
	Heather	-23.0638	6.389475	-3.60965	0.000307
	Suburban	-2.54546	0.264432	-9.62612	6.20E-22
	Urban	-1.4091	0.511155	-2.7567	0.005839
	River length	-1.11E-05	1.03E-05	-1.07829	0.280905
	Cereals	-2.8081	0.300032	-9.35935	8.02E-21
	General cropping	1.336869	0.913106	1.46409	0.143169
	Dairy	-0.25759	0.106564	-2.41726	0.015638
	Lowland cattle/sheep	-0.25742	0.113912	-2.25982	0.023833
Skylark	Mixed	0.026466	0.158491	0.16699	0.867378
	Specialist sheep	-0.42836	0.108551	-3.94618	7.94E-05
	Specialist beef	-0.61355	0.244996	-2.50433	0.012268
	SDA mixed	-0.33104	0.14608	-2.26617	0.023441
	DA various	-1.44248	0.122663	-11.7597	6.29E-32
	Woodland	-1.2279	0.163974	-7.48838	6.97E-14
	Acid grassland	0.946586	0.074947	12.63009	1.44E-36
	Freshwater	-1.889	0.653935	-2.88867	0.003869
	Heather	-0.27312	0.140042	-1.95024	0.051148
	Suburban	-4.11945	0.630039	-6.5384	6.22E-11
	Urban	2.863901	0.879902	3.254794	0.001135
	River length	5.46E-06	9.71E-06	0.562974	0.573452
	Cereals	-1.48993	0.345092	-4.31748	1.58E-05
	General cropping	-1.79641	0.964798	-1.86196	0.062609
	Dairy	-0.85968	0.16618	-5.17315	2.30E-07
	Lowland cattle/sheep	-0.60003	0.209694	-2.86146	0.004217
Starling	Mixed	-0.07547	0.24528	-0.30767	0.758332
	Specialist sheep	-0.7868	0.071008	-11.0804	1.56E-28
	Specialist beef	-1.19273	0.311671	-3.8269	0.00013
	SDA mixed	-1.04934	0.135713	-7.732	1.06E-14
	DA various	-1.7238	0.187276	-9.20459	3.43E-20
	Woodland	-1.62609	0.161361	-10.0773	6.96E-24
	Acid grassland	-1.48267	0.32238	-4.59913	4.24E-06
	Freshwater	-9.62141	2.112824	-4.55382	5.27E-06
	Heather	-9.3382	8.024833	-1.16366	0.244561
	Suburban	-0.49905	0.166889	-2.99029	0.002787
	Urban	-0.01969	0.204629	-0.0962	0.923359
	River length	-5.50E-05	1.34E-05	-4.09992	4.13E-05
	Cereals	-0.05153	0.248283	-0.20753	0.835598
	General cropping	-3.12984	1.776189	-1.76211	0.078051
	Dairy	-0.42508	0.155611	-2.73168	0.006301
	Lowland cattle/sheep	-0.49689	0.190781	-2.60451	0.0092
Whitethroat	Mixed	-2.70418	0.46408	-5.82697	5.64E-09
	Specialist sheep	-0.12311	0.188214	-0.6541	0.513049
	Specialist beef	0.090994	0.415484	0.219008	0.826644
	SDA mixed	-2.6744	0.368712	-7.25338	4.07E-13
	DA various	-0.90188	0.168354	-5.35707	8.46E-08
	Woodland	-2.51488	0.222484	-11.3037	1.26E-29
	Acid grassland	-1.21247	0.268512	-4.51553	6.32E-06
	Freshwater	3.05654	0.988692	3.091497	0.001992
	Heather	0.211021	0.220967	0.95499	0.339583
	Suburban	-2.19328	0.391632	-5.60035	2.14E-08
	Urban	0.083384	0.546911	0.152464	0.878821
	River length	-9.33E-05	1.56E-05	-5.96867	2.39E-09
	Cereals	0.678499	0.248021	2.735654	0.006226
	General cropping	-1.47537	1.187943	-1.24195	0.214254
	Dairy	-0.23005	0.181402	-1.26817	0.204738
	Lowland cattle/sheep	-0.53149	0.205008	-2.59254	0.009527
	Mixed	0.335469	0.252288	1.329706	0.183615

	Variable	Estimate	Std. Error	Z value	P value
Woodpigeon	Specialist sheep	-0.36554	0.232292	-1.57361	0.115579
	Specialist beef	-2.79826	0.852575	-3.28212	0.00103
	SDA mixed	-0.9739	0.339183	-2.87131	0.004088
	DA various	0.673331	0.155027	4.343307	1.40E-05
	Woodland	-1.59118	0.21783	-7.30467	2.78E-13
	Acid grassland	-1.16282	0.102595	-11.3342	8.89E-30
	Freshwater	1.006841	0.434484	2.317328	0.020486
	Heather	-1.43181	0.281794	-5.08106	3.75E-07
	Suburban	1.021677	0.094257	10.83922	2.24E-27
	Urban	0.303758	0.170246	1.784235	0.074385
	River length	7.46E-06	6.41E-06	1.164567	0.244194
	Cereals	-0.07585	0.155667	-0.48724	0.626086
	General cropping	-1.85903	0.676553	-2.7478	0.006
	Dairy	0.208634	0.09665	2.158652	0.030877
	Lowland cattle/sheep	0.290568	0.096232	3.01946	0.002532
	Mixed	0.699409	0.146068	4.788241	1.68E-06
	Specialist sheep	-0.40857	0.093666	-4.36193	1.29E-05
	Specialist beef	-0.73867	0.243355	-3.03536	0.002402
	SDA mixed	-0.37705	0.130435	-2.89071	0.003844
	DA various	-0.61785	0.101678	-6.07655	1.23E-09
	Woodland	-0.15145	0.091044	-1.66349	0.096214

Table 4.2. Results from the Poisson GLMs testing the effects of various land-uses and farm types on the abundance of woodland species.

	Variable	Estimate	Std. Error	Z value	P value
Blackbird	Acid grassland	-1.38277	0.074601	-18.5356	1.07E-76
	Freshwater	-0.32467	0.385671	-0.84184	0.399878
	Heather	-1.79677	0.290494	-6.1852	6.20E-10
	Suburban	0.928548	0.074658	12.43728	1.64E-35
	Urban	0.09835	0.144574	0.680274	0.496331
	River length	1.02E-05	4.79E-06	2.12774	0.033359
	Cereals	0.524438	0.110834	4.731731	2.23E-06
	General cropping	-1.43495	0.494892	-2.89952	0.003737
	Dairy	-0.39336	0.083283	-4.72321	2.32E-06
	Lowland cattle/sheep	0.349275	0.073196	4.771773	1.83E-06
	Mixed	-0.01752	0.132927	-0.13178	0.895161
	Specialist sheep	-0.15163	0.066945	-2.26494	0.023516
	Specialist beef	0.063737	0.156759	0.40659	0.684309
	SDA mixed	-0.25621	0.096945	-2.64289	0.00822
	DA various	-0.04307	0.069979	-0.61547	0.538244
	Woodland	0.216963	0.065511	3.311858	0.000927
Blackcap	Acid grassland	-0.92738	0.157345	-5.89391	3.77E-09
	Freshwater	-0.33221	0.813146	-0.40854	0.682874
	Heather	-1.15635	0.670103	-1.72563	0.084414
	Suburban	-0.32109	0.186197	-1.72444	0.084628
	Urban	-0.55704	0.363521	-1.53233	0.125441
	River length	5.07E-05	9.11E-06	5.564425	2.63E-08
	Cereals	0.687714	0.195932	3.509965	0.000448
	General cropping	0.661948	0.459945	1.439192	0.150096
	Dairy	-0.173	0.158023	-1.09474	0.273629
	Lowland cattle/sheep	-0.16278	0.143383	-1.13525	0.25627
	Mixed	-0.14563	0.238484	-0.61063	0.541443
	Specialist sheep	-0.62956	0.136514	-4.61171	3.99E-06
	Specialist beef	0.034921	0.305778	0.114203	0.909077
	SDA mixed	-0.51996	0.195886	-2.65439	0.007945
	DA various	-0.4004	0.146667	-2.73001	0.006333
	Woodland	0.790015	0.119101	6.633169	3.29E-11
Blue tit	Acid grassland	-1.26329	0.103361	-12.2221	2.37E-34
	Freshwater	-0.02799	0.484255	-0.05779	0.953912

	Variable	Estimate	Std. Error	Z value	P value
	Heather	-3.66192	1.077801	-3.39759	0.00068
	Suburban	0.604714	0.107825	5.608318	2.04E-08
	Urban	-0.77673	0.253063	-3.06932	0.002145
	River length	2.21E-05	5.79E-06	3.82173	0.000133
	Cereals	0.123918	0.159224	0.77826	0.436416
	General cropping	0.098035	0.406367	0.241248	0.809363
	Dairy	0.264278	0.097906	2.699296	0.006949
	Lowland cattle/sheep	0.440907	0.092662	4.758237	1.95E-06
	Mixed	0.555357	0.151182	3.673434	0.000239
	Specialist sheep	0.41017	0.081718	5.019338	5.18E-07
	Specialist beef	-0.06654	0.191759	-0.347	0.728588
	SDA mixed	0.288155	0.112467	2.562139	0.010403
	DA various	-0.04603	0.091124	-0.50514	0.61346
	Woodland	0.578768	0.083562	6.926241	4.32E-12
Bullfinch	Acid grassland	-0.33123	0.360852	-0.9179	0.358672
	Freshwater	0.368402	1.020886	0.360865	0.7182
	Heather	1.935213	3.689307	0.524547	0.599898
	Suburban	-0.85221	0.381436	-2.23423	0.025468
	Urban	-1.0806	0.89727	-1.20432	0.228465
	River length	8.82E-06	1.87E-05	0.473101	0.636141
	Cereals	-0.75923	0.526212	-1.44282	0.149071
	General cropping	-0.30794	1.02688	-0.29988	0.764266
	Dairy	-0.47273	0.308517	-1.53225	0.12546
	Lowland cattle/sheep	-0.11786	0.277736	-0.42436	0.671307
	Mixed	-0.59169	0.568667	-1.04049	0.298111
	Specialist sheep	-0.46676	0.243981	-1.91309	0.055737
	Specialist beef	-0.58935	0.68612	-0.85896	0.390361
	SDA mixed	-0.17549	0.32556	-0.53904	0.589862
	DA various	-0.59123	0.276393	-2.13911	0.032427
	Woodland	0.064546	0.232735	0.277336	0.781522
Chaffinch	Acid grassland	-0.46706	0.059636	-7.83182	4.81E-15
	Freshwater	-0.38978	0.420064	-0.9279	0.35346
	Heather	-1.75018	0.243981	-7.17344	7.31E-13
	Suburban	-0.66618	0.128022	-5.20365	1.95E-07
	Urban	-2.87382	0.432599	-6.64315	3.07E-11
	River length	-1.19E-05	5.09E-06	-2.34016	0.019275
	Cereals	-0.309	0.145962	-2.11696	0.034263
	General cropping	-0.69088	0.430062	-1.60646	0.108172
	Dairy	0.140333	0.085355	1.644112	0.100153
	Lowland cattle/sheep	0.003459	0.088144	0.039239	0.9687
	Mixed	0.702088	0.129518	5.420785	5.93E-08
	Specialist sheep	0.529873	0.060159	8.80791	1.28E-18
	Specialist beef	0.41655	0.142881	2.915368	0.003553
	SDA mixed	0.214096	0.088052	2.431483	0.015037
	DA various	0.157488	0.074798	2.105497	0.035248
	Woodland	0.35015	0.069724	5.021921	5.12E-07
Chiffchaff	Acid grassland	-1.40857	0.170962	-8.23906	1.74E-16
	Freshwater	1.246956	0.575538	2.166591	0.030266
	Heather	-1.1409	0.39844	-2.86341	0.004191
	Suburban	-0.09532	0.171338	-0.55635	0.57797
	Urban	0.919087	0.380019	2.418532	0.015583
	River length	3.56E-05	8.04E-06	4.423754	9.70E-06
	Cereals	0.33554	0.198578	1.68972	0.091082
	General cropping	-0.10023	0.549614	-0.18237	0.855293
	Dairy	0.396658	0.131822	3.009033	0.002621
	Lowland cattle/sheep	0.513887	0.12322	4.1705	3.04E-05
	Mixed	0.742487	0.197242	3.76435	0.000167
	Specialist sheep	-0.07335	0.131386	-0.5583	0.576642
	Specialist beef	-0.39204	0.31205	-1.25634	0.208994
	SDA mixed	0.465597	0.158877	2.930555	0.003384
	DA various	0.492883	0.114651	4.298998	1.72E-05
	Woodland	1.008803	0.110467	9.132182	6.71E-20
Coastal tit	Acid grassland	-0.15973	0.179626	-0.88926	0.373865
	Freshwater	0.085813	1.230306	0.069749	0.944393

	Variable	Estimate	Std. Error	Z value	P value
	Heather	-0.77465	0.620646	-1.24813	0.211984
	Suburban	-0.52023	0.303117	-1.71628	0.086111
	Urban	-1.21375	0.784391	-1.54738	0.121772
	River length	-3.03E-06	1.41E-05	-0.21556	0.829328
	Cereals	-0.71864	0.405618	-1.77172	0.076442
	General cropping	-3.56452	1.698286	-2.0989	0.035826
	Dairy	-1.15597	0.319579	-3.61717	0.000298
	Lowland cattle/sheep	-0.61654	0.265626	-2.32109	0.020282
	Mixed	1.143966	0.487662	2.345818	0.018985
	Specialist sheep	-0.23912	0.178877	-1.33679	0.181291
	Specialist beef	-0.21611	0.412761	-0.52358	0.600573
	SDA mixed	-0.50372	0.274603	-1.83436	0.0666
	DA various	-1.05276	0.264118	-3.98594	6.72E-05
	Woodland	1.774448	0.174832	10.14947	3.33E-24
Duncock	Acid grassland	-0.92047	0.143056	-6.43436	1.24E-10
	Freshwater	-1.69221	0.835653	-2.02502	0.042865
	Heather	-1.50916	0.520767	-2.89795	0.003756
	Suburban	0.404244	0.152376	2.652947	0.007979
	Urban	-0.86599	0.318739	-2.71693	0.006589
	River length	-2.55E-05	9.30E-06	-2.74168	0.006113
	Cereals	-0.62514	0.243464	-2.5677	0.010238
	General cropping	-0.68709	0.736787	-0.93255	0.351054
	Dairy	0.381474	0.127321	2.996164	0.002734
	Lowland cattle/sheep	0.164561	0.135349	1.21583	0.22405
	Mixed	1.032718	0.184281	5.604024	2.09E-08
	Specialist sheep	-0.54952	0.132537	-4.14616	3.38E-05
	Specialist beef	-0.00708	0.305919	-0.02314	0.981539
	SDA mixed	-0.11506	0.172818	-0.66582	0.505528
	DA various	0.133326	0.121906	1.093684	0.274093
	Woodland	-0.72109	0.135463	-5.32313	1.02E-07
Garden warbler	Acid grassland	0.171079	0.254981	0.67095	0.502253
	Freshwater	5.117852	1.914294	2.673494	0.007507
	Heather	-1.92213	1.861801	-1.0324	0.301883
	Suburban	1.653211	0.594147	2.782494	0.005394
	Urban	-1.93492	2.997882	-0.64543	0.518649
	River length	4.32E-05	1.90E-05	2.268436	0.023303
	Cereals	-0.72812	0.662923	-1.09835	0.272052
	General cropping	0.377543	3.477541	0.108566	0.913547
	Dairy	-0.25721	0.431141	-0.59659	0.550783
	Lowland cattle/sheep	-0.38024	0.411883	-0.92318	0.355915
	Mixed	0.414147	0.658731	0.628705	0.529542
	Specialist sheep	0.239634	0.249112	0.961954	0.336073
	Specialist beef	0.372455	0.495607	0.751514	0.452344
	SDA mixed	0.367761	0.330323	1.113337	0.265564
	DA various	0.45677	0.285986	1.597175	0.110227
	Woodland	1.005341	0.277368	3.624567	0.000289
Goldcrest	Acid grassland	-1.06914	0.15101	-7.07991	1.44E-12
	Freshwater	2.93168	0.512382	5.721671	1.05E-08
	Heather	0.876394	0.390825	2.242417	0.024934
	Suburban	-0.23247	0.162031	-1.4347	0.151372
	Urban	-0.59021	0.29138	-2.02556	0.04281
	River length	-1.85E-05	9.00E-06	-2.05926	0.039469
	Cereals	-0.84153	0.239238	-3.51756	0.000436
	General cropping	-0.61885	0.663698	-0.93242	0.351118
	Dairy	-0.44704	0.135815	-3.29151	0.000997
	Lowland cattle/sheep	0.31982	0.12677	2.522833	0.011641
	Mixed	1.018961	0.186691	5.458005	4.82E-08
	Specialist sheep	-0.57526	0.128329	-4.48269	7.37E-06
	Specialist beef	-0.06589	0.280233	-0.23514	0.814101
	SDA mixed	0.359949	0.151798	2.37123	0.017729
	DA various	-0.01156	0.115492	-0.10008	0.920278
	Woodland	-0.72813	0.136606	-5.33015	9.81E-08
Great spotted wood	Acid grassland	-0.75663	0.248754	-3.04165	0.002353
	Freshwater	-1.53814	1.268148	-1.2129	0.225168

	Variable	Estimate	Std. Error	Z value	P value
Great tit	Heather	-0.99898	1.868554	-0.53463	0.592908
	Suburban	-0.10824	0.339354	-0.31896	0.749758
	Urban	-1.20449	0.973595	-1.23716	0.216028
	River length	1.82E-05	1.51E-05	1.208846	0.226722
	Cereals	0.187211	0.397786	0.470632	0.637903
	General cropping	0.229044	0.879559	0.260408	0.794549
	Dairy	-0.4137	0.277944	-1.48842	0.136641
	Lowland cattle/sheep	-0.10491	0.262532	-0.39961	0.689446
	Mixed	0.045521	0.388727	0.117102	0.90678
	Specialist sheep	-0.03071	0.217477	-0.14122	0.887699
	Specialist beef	-0.05689	0.518471	-0.10973	0.912624
	SDA mixed	0.061745	0.300183	0.205692	0.837031
	DA various	-0.06301	0.238196	-0.26453	0.791372
	Woodland	0.36048	0.222596	1.619436	0.105354
	Acid grassland	-1.02275	0.118174	-8.65462	4.95E-18
Green woodpecker	Freshwater	0.315074	0.557422	0.565233	0.571915
	Heather	-0.82831	0.518375	-1.5979	0.110066
	Suburban	0.297088	0.140682	2.111779	0.034705
	Urban	-0.88046	0.319036	-2.75974	0.005785
	River length	1.66E-05	7.60E-06	2.188593	0.028626
	Cereals	0.211378	0.184786	1.143904	0.252663
	General cropping	-1.43636	0.726963	-1.97583	0.048174
	Dairy	-0.48793	0.136888	-3.56443	0.000365
	Lowland cattle/sheep	0.398552	0.116783	3.41277	0.000643
	Mixed	0.492756	0.188496	2.614146	0.008945
	Specialist sheep	0.0226	0.105375	0.21447	0.830181
	Specialist beef	-0.19483	0.246406	-0.79071	0.429116
	SDA mixed	-0.11934	0.146315	-0.81567	0.414692
	DA various	-0.01345	0.112963	-0.11909	0.905201
	Woodland	0.380186	0.105917	3.589452	0.000331
Jay	Acid grassland	0.76857	0.332772	2.309602	0.02091
	Freshwater	-0.46771	4.094681	-0.11422	0.909061
	Heather	-3.55829	4.471029	-0.79585	0.426117
	Suburban	0.480888	0.567544	0.847314	0.39682
	Urban	-0.24518	1.699386	-0.14428	0.885282
	River length	3.93E-05	3.05E-05	1.289534	0.197212
	Cereals	0.432329	0.66146	0.653599	0.51337
	General cropping	-28.7765	49.56544	-0.58058	0.561526
	Dairy	0.075656	0.786833	0.096153	0.923399
	Lowland cattle/sheep	0.560608	0.449197	1.248022	0.212023
	Mixed	-0.17338	1.119602	-0.15486	0.876931
	Specialist sheep	0.455945	0.403849	1.128999	0.258898
	Specialist beef	0.810366	0.785689	1.031409	0.302349
	SDA mixed	-0.00196	0.546451	-0.00359	0.997139
	DA various	0.721829	0.493271	1.463352	0.143371
Long-tailed tit	Woodland	0.688173	0.469258	1.466513	0.142508
	Acid grassland	-0.17248	0.225239	-0.76574	0.44383
	Freshwater	0.647944	1.686672	0.384155	0.700863
	Heather	-0.12588	0.723138	-0.17408	0.861806
	Suburban	-0.28735	0.415141	-0.69217	0.488829
	Urban	0.544752	0.544637	1.00021	0.317209
	River length	1.29E-05	1.74E-05	0.74213	0.458009
	Cereals	0.387465	0.421427	0.919413	0.35788
	General cropping	-1.00762	1.343666	-0.7499	0.453312
	Dairy	0.155302	0.32438	0.478767	0.632105
	Lowland cattle/sheep	-0.24937	0.312717	-0.79744	0.425198
	Mixed	0.272157	0.553253	0.491922	0.622775
	Specialist sheep	0.168691	0.230912	0.730541	0.465059
	Specialist beef	0.127745	0.506317	0.252302	0.800808
	SDA mixed	-0.41686	0.367423	-1.13456	0.256561
Long-tailed tit	DA various	0.156663	0.280868	0.557782	0.576993
	Woodland	0.542574	0.24927	2.176652	0.029507
	Acid grassland	-0.32544	0.278289	-1.16945	0.242223
Long-tailed tit	Freshwater	3.399795	0.738694	4.602438	4.18E-06
	Heather	1.914247	3.177577	0.602423	0.546892

	Variable	Estimate	Std. Error	Z value	P value
	Suburban	0.090752	0.266934	0.339977	0.733874
	Urban	-0.26147	0.549835	-0.47555	0.634396
	River length	-4.48E-05	1.56E-05	-2.86703	0.004143
	Cereals	0.124643	0.309527	0.402688	0.687178
	General cropping	-2.73548	1.5745	-1.73737	0.082322
	Dairy	-0.55568	0.23137	-2.4017	0.016319
	Lowland cattle/sheep	0.185418	0.231163	0.802112	0.422488
	Mixed	0.886069	0.314581	2.816661	0.004853
	Specialist sheep	0.073908	0.210442	0.351205	0.725434
	Specialist beef	0.62297	0.492105	1.26593	0.205538
	SDA mixed	-0.47459	0.319231	-1.48665	0.137107
	DA various	-0.03001	0.230755	-0.13006	0.89652
	Woodland	-0.27143	0.219603	-1.23601	0.216456
Nuthatch	Acid grassland	-0.85605	0.250964	-3.41103	0.000647
	Freshwater	2.259838	1.136369	1.988649	0.04674
	Heather	3.338691	3.163866	1.055257	0.291308
	Suburban	0.123253	0.31373	0.392863	0.694421
	Urban	0.157191	1.18817	0.132297	0.89475
	River length	7.08E-06	1.67E-05	0.424163	0.671447
	Cereals	-0.13621	0.409883	-0.33232	0.739649
	General cropping	0.773575	0.683048	1.132534	0.25741
	Dairy	-1.16089	0.355692	-3.26374	0.0011
	Lowland cattle/sheep	-0.55265	0.291809	-1.89387	0.058242
	Mixed	0.059781	0.501827	0.119126	0.905175
	Specialist sheep	-0.0044	0.203428	-0.02163	0.982747
	Specialist beef	-0.47678	0.487253	-0.97851	0.327824
	SDA mixed	0.156888	0.286608	0.547395	0.584107
	DA various	-0.35314	0.259765	-1.35945	0.174003
	Woodland	0.836273	0.260386	3.211664	0.00132
Redstart	Acid grassland	-0.34331	0.13438	-2.55479	0.010625
	Freshwater	-1.84132	1.390515	-1.3242	0.185437
	Heather	-1.17971	0.422418	-2.79275	0.005226
	Suburban	-1.3033	0.962632	-1.35389	0.175772
	Urban	1.182755	5.558542	0.212782	0.831497
	River length	-3.07E-05	1.29E-05	-2.37805	0.017404
	Cereals	1.077483	0.467046	2.307018	0.021054
	General cropping	-7117.86	5226.86	-1.36178	0.173266
	Dairy	-1.35347	0.385234	-3.51337	0.000442
	Lowland cattle/sheep	-0.28425	0.331398	-0.85774	0.391035
	Mixed	-1.36938	0.557562	-2.45601	0.014049
	Specialist sheep	0.753426	0.145781	5.168186	2.36E-07
	Specialist beef	0.276378	0.353691	0.78141	0.434562
	SDA mixed	0.438991	0.200495	2.189536	0.028558
	DA various	-0.07671	0.224848	-0.34114	0.732995
	Woodland	0.10875	0.204802	0.530999	0.595419
Robin	Acid grassland	-1.07516	0.078301	-13.7312	6.60E-43
	Freshwater	0.029191	0.438895	0.06651	0.946972
	Heather	-1.23622	0.287969	-4.29289	1.76E-05
	Suburban	0.16368	0.108315	1.511149	0.13075
	Urban	-0.88966	0.242612	-3.66701	0.000245
	River length	3.55E-06	5.62E-06	0.631196	0.527912
	Cereals	0.337931	0.136343	2.478541	0.013192
	General cropping	0.887156	0.305893	2.900219	0.003729
	Dairy	-0.07732	0.09597	-0.80565	0.420444
	Lowland cattle/sheep	-0.03782	0.092864	-0.40722	0.683848
	Mixed	0.009735	0.154669	0.06294	0.949814
	Specialist sheep	0.150921	0.073183	2.062251	0.039184
	Specialist beef	0.208367	0.16892	1.233526	0.21738
	SDA mixed	-0.11414	0.108261	-1.05434	0.291725
	DA various	-0.26811	0.088476	-3.03028	0.002443
	Woodland	0.547035	0.07602	7.195951	6.20E-13
Song thrush	Acid grassland	-0.45349	0.114282	-3.9682	7.24E-05
	Freshwater	1.628049	0.531337	3.064059	0.002184
	Heather	-1.38692	0.566925	-2.44638	0.01443

	Variable	Estimate	Std. Error	Z value	P value
Spotted flycatcher	Suburban	0.077179	0.163726	0.471391	0.637362
	Urban	-0.67885	0.38068	-1.78325	0.074545
	River length	4.77E-05	8.06E-06	5.920144	3.22E-09
	Cereals	0.353193	0.202358	1.745386	0.080918
	General cropping	-0.04767	0.541534	-0.08802	0.929861
	Dairy	-0.31364	0.154837	-2.02562	0.042804
	Lowland cattle/sheep	0.315739	0.128233	2.462225	0.013808
	Mixed	-0.11965	0.244502	-0.48937	0.624582
	Specialist sheep	-0.17361	0.111062	-1.56323	0.117999
	Specialist beef	-0.77472	0.292822	-2.64572	0.008152
	SDA mixed	-0.39784	0.172563	-2.30549	0.021139
	DA various	0.074853	0.121432	0.61642	0.537618
	Woodland	1.262378	0.103322	12.21786	2.50E-34
	Acid grassland	-0.48385	0.488746	-0.98997	0.322187
	Freshwater	11.38439	2.979505	3.8209	0.000133
	Heather	-0.43409	2.813738	-0.15427	0.877393
	Suburban	-0.78385	1.390069	-0.56389	0.572826
	Urban	-3.8929	11.73066	-0.33186	0.739997
	River length	-1.01E-05	4.67E-05	-0.21625	0.828794
	Cereals	-1.37179	1.111216	-1.2345	0.217018
	General cropping	-7.75632	7.464631	-1.03908	0.298769
	Dairy	-0.06781	0.605269	-0.11203	0.910798
	Lowland cattle/sheep	0.407411	0.510399	0.79822	0.424743
	Mixed	1.458667	1.712453	0.8518	0.394325
	Specialist sheep	-0.22398	0.530002	-0.4226	0.672587
	Specialist beef	-0.11563	1.046527	-0.11049	0.912024
Tawny owl	SDA mixed	1.220169	0.610221	1.999552	0.045549
	DA various	0.338129	0.436379	0.774851	0.438428
	Woodland	0.558049	0.594701	0.93837	0.348054
	Acid grassland	0.267432	1.223106	0.21865	0.826923
	Freshwater	1.393611	2.762336	0.504505	0.613907
	Heather	-2.79936	16.68612	-0.16777	0.866767
	Suburban	3.099656	3.586726	0.864202	0.387477
	Urban	-21.1594	44.55764	-0.47488	0.634875
	River length	1.84E-05	9.38E-05	0.196028	0.844588
	Cereals	-0.03081	2.001603	-0.01539	0.98772
	Dairy	-0.45643	1.464493	-0.31166	0.755297
	Lowland cattle/sheep	-0.36323	1.19169	-0.3048	0.760515
	Mixed	-0.97702	4.945441	-0.19756	0.84339
	Specialist sheep	-0.47628	1.027378	-0.46358	0.642946
Tree pipit	Specialist beef	-1.31349	8.986185	-0.14617	0.883789
	SDA mixed	0.341276	1.991542	0.171363	0.863939
	DA various	0.72529	3.092685	0.234518	0.814583
	Woodland	0.025396	1.145355	0.022173	0.98231
	Acid grassland	0.257896	0.233592	1.104042	0.269575
	Freshwater	3.209742	3.719021	0.863061	0.388104
	Heather	-0.0165	0.427876	-0.03856	0.969238
	Suburban	-6.7722	2.58541	-2.61939	0.008809
	Urban	6.011553	12.84519	0.468	0.639784
	River length	-4.92E-05	2.54E-05	-1.93908	0.052492
	Cereals	1.468361	1.067648	1.375323	0.169031
	Dairy	-1.70582	0.739208	-2.30763	0.021019
	Lowland cattle/sheep	0.706773	0.411727	1.716605	0.086051
	Mixed	-1.89757	2.964506	-0.6401	0.522111
Trecreeper	Specialist sheep	-0.86617	0.240231	-3.60556	0.000311
	Specialist beef	-0.99091	0.591887	-1.67415	0.094101
	SDA mixed	-0.71493	0.335272	-2.13239	0.032975
	DA various	0.218216	0.348262	0.626587	0.53093
	Woodland	0.384006	0.297875	1.289153	0.197345
	Acid grassland	-0.65168	0.373696	-1.74387	0.081182
	Freshwater	3.031219	1.387227	2.185092	0.028882
Trecreeper	Heather	-0.37171	3.777032	-0.09841	0.921604
	Suburban	-0.1549	0.573591	-0.27005	0.787123
	Urban	-1.11091	1.275469	-0.87098	0.383764
	River length	3.66E-05	2.23E-05	1.637205	0.101588

	Variable	Estimate	Std. Error	Z value	P value
Willow warbler	Cereals	0.463354	0.48885	0.947845	0.343209
	Dairy	-1.34364	1.847992	-0.72708	0.467177
	Lowland cattle/sheep	-0.41246	0.556614	-0.74102	0.458684
	Mixed	0.377979	0.44775	0.844175	0.398572
	Specialist sheep	-0.88679	0.800481	-1.10782	0.267941
	Specialist beef	-0.16532	0.324229	-0.50988	0.610139
	SDA mixed	0.160869	0.618517	0.260089	0.794795
	DA various	0.600761	0.417171	1.440086	0.149843
	Woodland	-0.22521	0.36614	-0.6151	0.538487
	Acid grassland	0.165242	0.073997	2.233099	0.025542
	Freshwater	1.226882	0.485669	2.526166	0.011531
	Heather	-0.35064	0.195043	-1.79775	0.072217
	Suburban	-0.68748	0.22692	-3.02963	0.002449
	Urban	-0.39579	0.400983	-0.98705	0.32362
	River length	3.52E-05	6.83E-06	5.149512	2.61E-07
	Cereals	-0.94077	0.292296	-3.21856	0.001288
	General cropping	-2.69477	0.987126	-2.72992	0.006335
	Dairy	-0.76742	0.161373	-4.75555	1.98E-06
	Lowland cattle/sheep	-0.61826	0.14629	-4.22627	2.38E-05
Wren	Mixed	-0.76547	0.30191	-2.53544	0.011231
	Specialist sheep	0.169107	0.079745	2.120583	0.033957
	Specialist beef	0.202342	0.191231	1.058105	0.290007
	SDA mixed	0.024913	0.113671	0.219166	0.826521
	DA various	-0.33885	0.117764	-2.87735	0.00401
	Woodland	1.107859	0.091216	12.14547	6.06E-34
	Acid grassland	-0.78638	0.061793	-12.726	4.24E-37
	Freshwater	-0.23018	0.385533	-0.59705	0.550472
	Heather	-0.4602	0.126923	-3.62584	0.000288
	Suburban	-0.07161	0.098466	-0.72727	0.467059
	Urban	-1.04516	0.22899	-4.56423	5.01E-06
	River length	1.27E-05	4.87E-06	2.60617	0.009156
	Cereals	-0.15539	0.130369	-1.19192	0.233292
	General cropping	0.748853	0.26953	2.778362	0.005463
	Dairy	0.143182	0.078755	1.818061	0.069055
	Lowland cattle/sheep	-0.01531	0.07853	-0.19499	0.845403
	Mixed	0.440473	0.1236	3.563697	0.000366
	Specialist sheep	-0.16598	0.062999	-2.63461	0.008423
	Specialist beef	-0.15021	0.15908	-0.94425	0.34504
	SDA mixed	-0.05524	0.09008	-0.61324	0.53972
	DA various	-0.18647	0.074129	-2.5155	0.011886
	Woodland	0.608478	0.0636	9.567336	1.10E-21

Table 4.3 Results from the Poisson GLMs testing the effects of various land-uses and farm types on the abundance of water and wetland species.

	Variable	Estimate	Std. Error	Z value	P value
Dipper	Acid grassland	-0.16793	0.568682	-0.29529	0.767772
	Freshwater	-2.4473	8.643267	-0.28315	0.777065
	Heather	2.371906	5.26701	0.450333	0.652471
	Suburban	1.165868	2.476822	0.470711	0.637847
	Urban	-4.26297	6.113297	-0.69733	0.485598
	River length	-1.25E-05	4.61E-05	-0.27029	0.78694
	Cereals	0.3959	0.941472	0.420512	0.674112
	General cropping	-30.2936	51.79858	-0.58483	0.558659
	Dairy	-0.4435	1.148711	-0.38608	0.699434
	Lowland cattle/sheep	0.099982	1.219402	0.081993	0.934652
	Mixed	2.111604	2.601527	0.811679	0.416976
	Specialist sheep	0.48552	0.555339	0.874277	0.381967
	Specialist beef	-0.37723	3.370133	-0.11193	0.910877
	SDA mixed	0.385803	0.931876	0.414007	0.678869
	DA various	0.390902	0.909939	0.429591	0.667493
	Woodland	-0.0141	1.091742	-0.01291	0.989698

	Variable	Estimate	Std. Error	Z value	P value
Grey heron	Acid grassland	-2.04872	0.812947	-2.52011	0.011732
	Freshwater	4.327252	0.993675	4.354796	1.33E-05
	Heather	-2.16309	2.781891	-0.77756	0.436829
	Suburban	0.244339	0.772431	0.316324	0.751757
	Urban	-0.87885	1.155212	-0.76077	0.446793
	River length	3.20E-05	3.30E-05	0.970875	0.331611
	Cereals	0.520394	0.704569	0.738599	0.460151
	General cropping	-87.0108	313.4618	-0.27758	0.781335
	Dairy	-0.70649	0.661376	-1.06821	0.285426
	Lowland cattle/sheep	-0.17691	0.694424	-0.25476	0.798905
	Mixed	-1.37536	1.289248	-1.06679	0.286065
	Specialist sheep	1.135114	0.45399	2.500307	0.012409
	Specialist beef	-1.4247	1.367928	-1.0415	0.297643
	SDA mixed	-0.71305	0.792865	-0.89933	0.368476
	DA various	-0.11137	0.548935	-0.20289	0.839222
	Woodland	-0.68793	0.564587	-1.21847	0.223046
Mallard	Acid grassland	0.654512	0.198951	3.289815	0.001003
	Freshwater	4.458789	0.512819	8.694662	3.48E-18
	Heather	-2.32981	0.977719	-2.3829	0.017177
	Suburban	2.13827	0.185165	11.54792	7.56E-31
	Urban	0.661982	0.355723	1.860946	0.062752
	River length	8.45E-05	1.27E-05	6.648612	2.96E-11
	Cereals	1.127277	0.291183	3.871363	0.000108
	General cropping	1.853014	2.294206	0.807693	0.419267
	Dairy	-0.3245	0.269803	-1.20273	0.229081
	Lowland cattle/sheep	1.523284	0.228703	6.660548	2.73E-11
	Mixed	0.76027	0.357836	2.12463	0.033617
	Specialist sheep	0.514213	0.196585	2.61573	0.008904
	Specialist beef	-1.12245	0.537315	-2.08899	0.036708
	SDA mixed	-1.25138	0.388163	-3.22386	0.001265
	DA various	1.063361	0.202307	5.256169	1.47E-07
	Woodland	-0.326	0.239144	-1.36318	0.172825
Reed bunting	Acid grassland	-0.7112	0.229922	-3.09321	0.00198
	Freshwater	-0.44527	1.241176	-0.35875	0.719782
	Heather	-0.67613	0.364544	-1.85472	0.063636
	Suburban	-0.82137	0.929094	-0.88405	0.376669
	Urban	-1.25346	2.073928	-0.60439	0.545583
	River length	5.81E-05	2.48E-05	2.336953	0.019442
	Cereals	0.197736	0.738469	0.267765	0.78888
	Dairy	-2.03933	0.684785	-2.97806	0.002901
	Lowland cattle/sheep	-0.65819	0.556689	-1.18234	0.237073
	Mixed	-3.5163	3.239405	-1.08548	0.277711
	Specialist sheep	-0.6086	0.261543	-2.32697	0.019967
	Specialist beef	-1.46318	0.844694	-1.7322	0.083238
	SDA mixed	-0.5511	0.384171	-1.43451	0.151427
	DA various	-0.93644	0.518309	-1.80672	0.070806
	Woodland	-2.355	0.493614	-4.77093	1.83E-06
Sedge warbler	Acid grassland	1.734505	0.921252	1.882768	0.059732
	Freshwater	-2.1282	1.667143	-1.27655	0.20176
	Heather	-1.48384	0.787468	-1.88432	0.059522
	Suburban	-2.91067	1.147703	-2.53609	0.01121
	Urban	-1.72212	1.768061	-0.97402	0.330048
	River length	9.94E-05	2.30E-05	4.321938	1.55E-05
	Cereals	0.473876	0.736889	0.643077	0.520174
	General cropping	0.993672	1.855458	0.53554	0.592276
	Dairy	-1.97317	0.603813	-3.26786	0.001084
	Lowland cattle/sheep	-0.00323	0.557767	-0.0058	0.995375
	Mixed	-1.0583	0.817148	-1.29511	0.195282
	Specialist sheep	-1.7782	0.459059	-3.87358	0.000107
	Specialist beef	1.276581	3.07316	0.415397	0.677851
	SDA mixed	-4.3228	1.143006	-3.78196	0.000156
	DA various	-1.26125	0.352679	-3.5762	0.000349
	Woodland	-5.58329	1.003211	-5.56543	2.62E-08

Table 4.4. Results from the Poisson GLMs testing the effects of various land-uses and farm types on the abundance of 'other' species.

	Variable	Estimate	Std. Error	Z value	P value
Buzzard	Acid grassland	0.367136	0.176809	2.076457	0.037852
	Freshwater	0.028915	1.491225	0.01939	0.98453
	Heather	0.136964	0.430939	0.317828	0.750616
	Suburban	-0.72389	0.565173	-1.28083	0.200252
	Urban	-0.17974	1.515221	-0.11862	0.905574
	River length	-4.24E-05	1.75E-05	-2.42615	0.01526
	Cereals	-0.09488	0.482752	-0.19654	0.844185
	General cropping	-2.97249	4.102335	-0.72459	0.468706
	Dairy	0.15809	0.29156	0.542222	0.587666
	Lowland cattle/sheep	1.148599	0.241355	4.75896	1.95E-06
	Mixed	0.831783	0.420724	1.977029	0.048038
	Specialist sheep	0.288611	0.197964	1.457896	0.144869
	Specialist beef	0.30873	0.560555	0.550757	0.5818
	SDA mixed	0.681092	0.260153	2.618039	0.008844
	DA various	0.910814	0.222106	4.100804	4.12E-05
	Woodland	0.379674	0.255536	1.485796	0.137333
Canada goose	Acid grassland	-0.31775	0.306138	-1.03792	0.299307
	Freshwater	9.187863	0.452401	20.30913	1.07E-91
	Heather	0.526188	0.32664	1.610909	0.107199
	Suburban	1.158497	0.251772	4.601383	4.20E-06
	Urban	1.774203	0.534511	3.319301	0.000902
	River length	2.85E-05	1.76E-05	1.616937	0.105892
	Cereals	0.860524	0.411917	2.089073	0.036701
	Dairy	0.119921	0.317803	0.377344	0.705918
	Lowland cattle/sheep	0.064164	0.338652	0.189469	0.849725
	Mixed	0.221669	0.649947	0.341057	0.733061
	Specialist sheep	-0.65722	0.28763	-2.28494	0.022317
	Specialist beef	-0.14147	0.839581	-0.16851	0.866185
	SDA mixed	-0.15597	0.422468	-0.36919	0.711985
	DA various	-0.1256	0.278381	-0.45119	0.651856
	Woodland	0.283309	0.315906	0.896816	0.369817
Carriion crow	Acid grassland	-0.75597	0.062657	-12.0653	1.61E-33
	Freshwater	-1.65022	0.529785	-3.11489	0.00184
	Heather	-0.80201	0.230064	-3.48601	0.00049
	Suburban	-0.19148	0.123832	-1.54625	0.122045
	Urban	-0.01369	0.207705	-0.06593	0.947436
	River length	-2.41E-05	5.68E-06	-4.25026	2.14E-05
	Cereals	0.81892	0.130048	6.297076	3.03E-10
	General cropping	-0.61775	0.563379	-1.09651	0.272855
	Dairy	0.931963	0.080115	11.63281	2.81E-31
	Lowland cattle/sheep	0.890491	0.085989	10.35593	3.93E-25
	Mixed	1.046467	0.127826	8.186652	2.69E-16
	Specialist sheep	0.943868	0.064924	14.538	6.96E-48
	Specialist beef	-0.06138	0.186809	-0.32855	0.742498
	SDA mixed	0.285883	0.098345	2.906931	0.00365
	DA various	0.542018	0.077555	6.988836	2.77E-12
	Woodland	-0.88613	0.09329	-9.49867	2.13E-21
Collared dove	Acid grassland	-0.88793	0.380218	-2.33531	0.019527
	Freshwater	-4.81974	1.567006	-3.07576	0.0021
	Heather	-5.2508	6.061383	-0.86627	0.386342
	Suburban	0.455829	0.188008	2.42452	0.015329
	Urban	-1.70385	0.390865	-4.35918	1.31E-05
	River length	-1.02E-05	1.66E-05	-0.61575	0.53806
	Cereals	-1.80649	0.454282	-3.97659	6.99E-05
	General cropping	-1.1728	2.375467	-0.49371	0.621508
	Dairy	-0.9461	0.226307	-4.1806	2.91E-05
	Lowland cattle/sheep	-0.72819	0.229493	-3.17302	0.001509
	Mixed	-1.08051	0.363665	-2.97117	0.002967
	Specialist sheep	-0.81245	0.225628	-3.60084	0.000317
	Specialist beef	0.351767	0.602317	0.584022	0.559205
	SDA mixed	-2.03967	0.427398	-4.7723	1.82E-06

	Variable	Estimate	Std. Error	Z value	P value
Cuckoo	DA various	-0.85815	0.197115	-4.35355	1.34E-05
	Woodland	-1.97904	0.263148	-7.52062	5.45E-14
	Acid grassland	-4.16E-05	0.207584	-0.0002	0.99984
	Freshwater	-1.59219	1.911075	-0.83314	0.404765
	Heather	0.347222	0.346529	1.002	0.316343
	Suburban	-1.76336	1.154032	-1.528	0.126513
	Urban	0.429409	1.306701	0.328621	0.742443
	River length	3.02E-05	2.10E-05	1.437282	0.150638
	Cereals	-0.88771	1.670509	-0.5314	0.595143
	General cropping	-4.50045	7.424494	-0.60616	0.544407
	Dairy	-0.98577	0.711518	-1.38545	0.165914
	Lowland cattle/sheep	-0.17065	0.528005	-0.3232	0.746544
	Mixed	0.235456	1.650924	0.142621	0.88659
	Specialist sheep	-0.02484	0.210845	-0.11779	0.906233
	Specialist beef	-0.45798	0.60777	-0.75355	0.451122
	SDA mixed	0.189707	0.313063	0.605971	0.544534
Grasshopper warbler	DA various	-0.3023	0.42853	-0.70543	0.480543
	Woodland	-0.00331	0.294685	-0.01123	0.991037
	Acid grassland	0.171079	0.254981	0.67095	0.502253
	Freshwater	5.117852	1.914294	2.673494	0.007507
	Heather	-1.92213	1.861801	-1.0324	0.301883
	Suburban	1.653211	0.594147	2.782494	0.005394
	Urban	-1.93492	2.997882	-0.64543	0.518649
	River length	4.32E-05	1.90E-05	2.268436	0.023303
	Cereals	-0.72812	0.662923	-1.09835	0.272052
	General cropping	0.377543	3.477541	0.108566	0.913547
	Dairy	-0.25721	0.431141	-0.59659	0.550783
	Lowland cattle/sheep	-0.38024	0.411883	-0.92318	0.355915
	Mixed	0.414147	0.658731	0.628705	0.529542
	Specialist sheep	0.239634	0.249112	0.961954	0.336073
	Specialist beef	0.372455	0.495607	0.751514	0.452344
	SDA mixed	0.367761	0.330323	1.113337	0.265564
House sparrow	DA various	0.45677	0.285986	1.597175	0.110227
	Woodland	1.005341	0.277368	3.624567	0.000289
	Acid grassland	-0.82259	0.141603	-5.80915	6.28E-09
	Freshwater	-2.26475	0.605393	-3.74096	0.000183
	Heather	-6.62942	2.859773	-2.31816	0.02044
	Suburban	1.099099	0.076427	14.38101	6.81E-47
	Urban	-0.38584	0.137367	-2.80882	0.004972
	River length	-5.01E-05	6.04E-06	-8.28784	1.15E-16
	Cereals	0.543468	0.115826	4.692105	2.70E-06
	General cropping	-8.08016	1.438555	-5.61686	1.94E-08
	Dairy	-0.37531	0.084187	-4.45804	8.27E-06
	Lowland cattle/sheep	-0.31886	0.094446	-3.37608	0.000735
	Mixed	0.855534	0.111213	7.692765	1.44E-14
	Specialist sheep	-0.84514	0.090718	-9.31613	1.21E-20
	Specialist beef	1.617199	0.140099	11.54325	7.98E-31
	SDA mixed	-1.18986	0.130785	-9.09783	9.22E-20
Magpie	DA various	-0.39992	0.079412	-5.03607	4.75E-07
	Woodland	-1.10722	0.103369	-10.7113	9.01E-27
	Acid grassland	-0.72112	0.150698	-4.7852	1.71E-06
	Freshwater	0.480067	0.666324	0.720471	0.471235
	Heather	0.058795	0.631437	0.093114	0.925813
	Suburban	1.302313	0.133704	9.740289	2.03E-22
	Urban	0.83487	0.207189	4.029508	5.59E-05
	River length	-1.22E-05	9.61E-06	-1.26617	0.205451
	Cereals	-0.59788	0.261639	-2.28513	0.022305
	General cropping	-7.39594	2.667331	-2.77279	0.005558
	Dairy	0.124686	0.143971	0.866048	0.386464
	Lowland cattle/sheep	0.413904	0.146108	2.832855	0.004613
	Mixed	0.800756	0.21517	3.721504	0.000198
	Specialist sheep	-0.09031	0.134739	-0.67029	0.502676
	Specialist beef	-0.11558	0.311404	-0.37114	0.71053
	SDA mixed	0.001074	0.182425	0.005888	0.995302
	DA various	0.312578	0.128893	2.425097	0.015304

	Variable	Estimate	Std. Error	Z value	P value
Meadow pipit	Woodland	-0.86087	0.166141	-5.18158	2.20E-07
	Acid grassland	0.890684	0.060949	14.61355	2.30E-48
	Freshwater	-0.27769	0.467074	-0.59453	0.552156
	Heather	1.182966	0.082834	14.2812	2.87E-46
	Suburban	-3.74261	0.597619	-6.26254	3.79E-10
	Urban	-1.36408	1.33472	-1.022	0.306781
	River length	-1.92E-05	6.90E-06	-2.77892	0.005454
	Cereals	-3.02484	1.107179	-2.73203	0.006295
	General cropping	-45.4932	34.36652	-1.32376	0.185581
	Dairy	-2.2428	0.293637	-7.63799	2.21E-14
	Lowland cattle/sheep	-1.76613	0.317821	-5.557	2.74E-08
	Mixed	-0.13243	0.303775	-0.43595	0.662873
	Specialist sheep	0.130353	0.05241	2.487184	0.012876
	Specialist beef	-1.0862	0.233139	-4.65905	3.18E-06
	SDA mixed	0.341351	0.07658	4.457467	8.29E-06
	DA various	-1.09542	0.154994	-7.06751	1.58E-12
	Woodland	-1.54117	0.128046	-12.0361	2.30E-33
Pheasant	Acid grassland	-0.13113	0.168724	-0.7772	0.437039
	Freshwater	0.323316	0.873149	0.370287	0.711169
	Heather	-0.29949	0.288678	-1.03745	0.299526
	Suburban	-1.31944	0.412282	-3.20033	0.001373
	Urban	-0.53528	0.947906	-0.5647	0.572276
	River length	5.61E-05	1.08E-05	5.218186	1.81E-07
	Cereals	0.178649	0.247831	0.720852	0.471
	General cropping	-3.91131	1.937667	-2.01857	0.043532
	Dairy	0.125703	0.171881	0.731338	0.464573
	Lowland cattle/sheep	1.111456	0.15006	7.406757	1.29E-13
	Mixed	1.483007	0.241168	6.149273	7.78E-10
	Specialist sheep	0.231186	0.155995	1.482012	0.138337
	Specialist beef	-1.3434	0.479874	-2.79948	0.005118
	SDA mixed	0.664633	0.185306	3.586681	0.000335
	DA various	0.956997	0.142393	6.720841	1.81E-11
	Woodland	0.728319	0.173027	4.209287	2.56E-05
Pied wagtail	Acid grassland	-0.24753	0.138578	-1.78623	0.074062
	Freshwater	1.499796	0.766615	1.956387	0.05042
	Heather	0.654743	0.573844	1.140978	0.253879
	Suburban	-0.57218	0.372262	-1.53704	0.124284
	Urban	0.370782	0.46651	0.794801	0.426729
	River length	6.73E-05	1.18E-05	5.683251	1.32E-08
	Cereals	-0.56181	0.490711	-1.14489	0.252257
	General cropping	-6.22101	5.423057	-1.14714	0.251323
	Dairy	-0.05305	0.235793	-0.22499	0.821986
	Lowland cattle/sheep	1.167186	0.207906	5.613997	1.98E-08
	Mixed	0.206731	0.373848	0.552981	0.580276
	Specialist sheep	0.611015	0.146194	4.179487	2.92E-05
	Specialist beef	1.07191	0.314234	3.411187	0.000647
	SDA mixed	-0.06944	0.218229	-0.3182	0.750337
	DA various	0.323215	0.186623	1.731915	0.083289
	Woodland	-0.72398	0.223724	-3.23603	0.001212
Stonechat	Acid grassland	-0.06013	0.155979	-0.38549	0.699873
	Freshwater	-2.65461	2.097309	-1.26572	0.205613
	Heather	0.141941	0.254134	0.558531	0.576482
	Suburban	-0.968	1.220198	-0.79331	0.427596
	Urban	-1.55005	1.593487	-0.97274	0.330682
	River length	-4.88E-05	1.88E-05	-2.59019	0.009592
	Cereals	-0.32394	2.108298	-0.15365	0.877884
	General cropping	-247.334	279.2419	-0.88573	0.375761
	Dairy	-0.91656	0.481193	-1.90476	0.056811
	Lowland cattle/sheep	-0.37978	0.97919	-0.38785	0.698126
	Mixed	1.796694	0.78003	2.303366	0.021258
	Specialist sheep	0.185473	0.175814	1.054939	0.291453
	Specialist beef	-1.09339	0.631302	-1.73196	0.08328
	SDA mixed	0.063539	0.246169	0.258113	0.79632
	DA various	0.14859	0.269665	0.551015	0.581623
	Woodland	-0.78271	0.309159	-2.53173	0.01135

	Variable	Estimate	Std. Error	Z value	P value
Swallow	Acid grassland	-1.36216	0.173628	-7.84529	4.32E-15
	Freshwater	-1.41944	1.015308	-1.39804	0.162101
	Heather	3.0781	0.643707	4.781838	1.74E-06
	Suburban	-0.66634	0.373415	-1.78444	0.074352
	Urban	-2.84169	1.007625	-2.82019	0.0048
	River length	1.96E-05	1.01E-05	1.936906	0.052757
	Cereals	0.236803	0.252095	0.939339	0.347557
	General cropping	-2.51442	1.192425	-2.10866	0.034974
	Dairy	0.19642	0.154523	1.271137	0.20368
	Lowland cattle/sheep	0.488954	0.153992	3.175198	0.001497
	Mixed	1.162774	0.203301	5.719469	1.07E-08
	Specialist sheep	-0.12349	0.15187	-0.81315	0.416129
	Specialist beef	-0.0421	0.314686	-0.13377	0.893581
	SDA mixed	-0.52492	0.205815	-2.55046	0.010758
	DA various	0.386857	0.141466	2.734633	0.006245
	Woodland	-1.14716	0.176114	-6.51374	7.33E-11
Wheatear	Acid grassland	0.251002	0.125735	1.996287	0.045903
	Freshwater	-0.10388	1.143607	-0.09084	0.927622
	Heather	-0.21363	0.301138	-0.70941	0.478071
	Suburban	-1.82551	1.301155	-1.40299	0.160619
	Urban	-3.40197	2.895173	-1.17505	0.239975
	River length	1.79E-05	1.48E-05	1.208071	0.22702
	Cereals	-1.3889	0.861569	-1.61206	0.106948
	General cropping	4.967689	20.83032	0.238484	0.811506
	Dairy	-0.23466	0.285053	-0.82323	0.410377
	Lowland cattle/sheep	-1.36252	0.4307	-3.1635	0.001559
	Mixed	-0.33901	0.48837	-0.69417	0.487577
	Specialist sheep	0.381638	0.122976	3.103351	0.001913
	Specialist beef	-1.81433	0.58189	-3.11799	0.001821
	SDA mixed	0.088345	0.207984	0.424768	0.671006
	DA various	-0.5754	0.252922	-2.275	0.022906
	Woodland	-2.28889	0.362856	-6.30798	2.83E-10
Whinchat	Acid grassland	1.131769	0.303078	3.734253	0.000188
	Freshwater	-3.8477	3.42403	-1.12374	0.261125
	Heather	0.838509	0.397364	2.110177	0.034843
	Suburban	-24.2905	17.55556	-1.38364	0.166469
	River length	5.78E-06	3.77E-05	0.153533	0.877978
	Dairy	-3.96387	7.493176	-0.529	0.596807
	Lowland cattle/sheep	0.528557	1.879256	0.281259	0.778512
	Mixed	2.903031	1.294515	2.242563	0.024925
	Specialist sheep	0.34234	0.229166	1.49385	0.135215
	Specialist beef	4.344301	1.008819	4.306324	1.66E-05
	SDA mixed	-0.59138	0.366702	-1.6127	0.10681
	DA various	-0.68951	1.653885	-0.4169	0.676748
	Woodland	-0.96316	0.557043	-1.72907	0.083797

Table 4.5. Predicted abundance and the percentage difference in predicted abundance from the baseline for farmland species in Wales under three different scenarios of Brexit. Blue and green shading illustrates a percentage increase and decrease, respectively, in abundance of at least 1% from the baseline. Abundances are estimated using only 1km squares that had BBS data in Wales. N = number of 1km squares that had BBS and scenario data.

Species	Generalism/ specialism	List	Baseline		No deal			EU deal			FTA		
			N	Predicted abundance	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)
Greenfinch	Generalist		227	1,799	219	1,971	10%	219	1,959	9%	227	2,003	11%
Jackdaw	Generalist		279	6,560	273	7,963	21%	273	7,860	20%	279	7,721	18%
Rook	Generalist		167	5,510	164	7,453	35%	164	7,293	32%	167	7,175	30%
Woodpigeon	Generalist		361	4,711	352	4,996	6%	352	4,890	4%	361	4,953	5%
Goldfinch	Specialist		315	3,001	308	3,467	16%	308	3,479	16%	315	3,426	14%
Linnet	Specialist	Red	212	2,673	206	3,608	35%	206	3,831	43%	212	3,623	36%
Skylark	Specialist	Red	213	3,862	207	5,217	35%	207	5,167	34%	213	5,386	39%
Starling	Specialist	Red	147	3,367	142	5,575	66%	142	5,488	63%	147	5,430	61%
Stock dove	Specialist	Amber	84	607,859	82	636,759	5%	82	637,126	5%	84	598,104	-2%
Whitethroat	Specialist		225	1,576	220	2,037	29%	220	2,142	36%	225	2,126	35%

Table 4.6. Predicted abundance and the percentage difference in predicted abundance from the baseline for woodland species in Wales under three different scenarios of Brexit. Blue and green shading illustrates a percentage increase and decrease, respectively, in abundance of at least 1% from the baseline. Abundances are estimated using only 1km squares that had BBS data in Wales. N = number of 1km squares that had BBS and scenario data.

Species	Generalism/ specialism	List	Baseline		No deal			EU deal			FTA		
			N	Predicted abundance	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)
Blackbird	Generalist	Amber	380	7,733	371	7,248	-6%	371	7,323	-5%	380	7,458	-4%
Blue tit	Generalist		349	5,205	341	4,463	-14%	341	4,521	-13%	349	4,471	-14%
Bullfinch	Generalist		207	1,222	201	1,219	0%	201	1,210	-1%	207	1,253	3%
Chaffinch	Generalist		373	7,067	364	6,376	-10%	364	6,482	-8%	373	6,311	-11%
Dunnock	Generalist	Amber	351	2,451	343	2,964	21%	343	2,870	17%	351	2,838	16%
Great tit	Generalist		353	3,266	345	2,883	-12%	345	2,963	-9%	353	3,016	-8%
Long-tailed tit	Generalist		210	1,641	203	1,711	4%	203	1,721	5%	210	1,736	6%
Robin	Generalist		370	5,649	361	4,962	-12%	361	4,946	-12%	370	5,013	-11%
Song thrush	Generalist	Red	353	2,748	344	1,968	-28%	344	1,997	-27%	353	2,155	-22%
Tawny owl	Generalist		31	602	30	583	-3%	30	601	0%	31	604	0%
Wren	Generalist		385	7,379	376	6,532	-11%	376	6,411	-13%	385	6,574	-11%
Blackcap	Specialist		306	2,428	297	2,088	-14%	297	2,004	-17%	306	2,154	-11%
Chiffchaff	Specialist	Amber	334	2,848	326	2,234	-22%	326	2,238	-21%	334	2,265	-20%
Coal tit	Specialist		213	1,499	208	946	-37%	208	933	-38%	213	1,075	-28%
Garden warbler	Specialist		165	1,039	159	814	-22%	159	824	-21%	165	834	-20%
Goldcrest	Specialist		236	1,743	230	1,217	-30%	230	1,202	-31%	236	1,328	-24%
Great spotted woodpecker	Specialist	Red	266	1,012	258	915	-10%	258	927	-8%	266	938	-7%
Green woodpecker	Specialist		125	660	123	559	-15%	123	565	-14%	125	565	-14%
Jay	Specialist		225	945	220	841	-11%	220	838	-11%	225	856	-9%
Nuthatch	Specialist		214	1,659	210	1,372	-17%	210	1,407	-15%	214	1,427	-14%
Redstart	Specialist	Amber	193	1,734	190	1,524	-12%	190	1,657	-4%	193	1,569	-10%
Spotted flycatcher	Specialist		81	825	80	721	-13%	80	728	-12%	81	711	-14%
Tree pipit	Specialist		103	1,854	100	1,687	-9%	100	1,732	-7%	103	1,854	0%
Treecreeper	Specialist		150	769	148	742	-4%	148	746	-3%	150	736	-4%
Willow warbler	Specialist	Amber	334	3,829	325	2,912	-24%	325	2,939	-23%	334	3,083	-19%

Table 4.7. Predicted abundance and the percentage difference in predicted abundance from the baseline for water and wetland species in Wales under three different scenarios of Brexit. Blue and green shading illustrates a percentage increase and decrease, respectively, in abundance of at least 1% from the baseline. Abundances are estimated using only 1km squares that had BBS data in Wales. N = number of 1km squares that had BBS and scenario data.

Species	Generalism/ specialism	List	Baseline			No deal			EU deal			FTA		
			N	Predicted abundance		N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)
Dipper	Fast flowing water	Amber	46	751	46	702	-7%	46	745	-1%	46	711	-5%	
Reed bunting	Reedbeds	Amber	91	983	89	1,496	52%	89	1,571	60%	91	1,562	59%	
Sedge warbler	Reedbeds		58	2,104	56	5,456	159%	56	4,525	115%	58	5,191	147%	
Mallard	Slow & standing water	Amber	158	2,086	155	1,980	-5%	155	2,175	4%	158	2,175	4%	
Moorhen	Slow & standing water		48	3,622	46	5,054	40%	46	5,197	43%	48	5,228	44%	
Grey heron	Other		74	576	71	580	1%	71	656	14%	74	621	8%	

Table 4.8. Predicted abundance and the percentage difference in predicted abundance from the baseline for species not listed as habitat indicators in Wales under three different scenarios of Brexit. Blue and green shading illustrates a percentage increase and decrease, respectively, in abundance of at least 1% from the baseline. Abundances are estimated using only 1km squares that had BBS data in Wales. N = number of 1km squares that had BBS and scenario data.

Species	List	Baseline		No deal			EU deal			FTA		
		N	Predicted abundance	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)	N	Predicted abundance	Difference from baseline (%)
Buzzard		296	856	291	757	-12%	291	783	-9%	296	758	-11%
Canada goose		85	2,000	83	1,956	-2%	83	1,897	-5%	85	1,961	-2%
Carriion crow		378	6,137	371	7,011	14%	371	7,232	18%	378	6,668	9%
Collared dove		184	1,795	178	2,810	57%	178	2,713	51%	184	2,790	55%
Cuckoo	Red	169	739	164	707	-4%	164	735	-1%	169	731	-1%
Grasshopper warbler	Red	57	1,039	57	814	-22%	57	824	-21%	57	834	-20%
House sparrow	Red	275	7,828	269	10,708	37%	269	9,912	27%	275	10,098	29%
Magpie		319	2,559	313	2,997	17%	313	3,021	18%	319	2,945	15%
Meadow pipit	Amber	220	4,925	215	5,754	17%	215	6,270	27%	220	5,708	16%
Pheasant		250	2,441	245	1,915	-22%	245	2,050	-16%	250	2,022	-17%
Pied wagtail		308	1,288	299	1,417	10%	299	1,461	13%	308	1,383	7%
Stonechat		133	1,289	130	1,384	7%	130	1,492	16%	133	1,438	12%
Swallow		269	3,009	263	3,659	22%	263	3,669	22%	269	3,685	22%
Wheatear		170	1,373	165	1,928	40%	165	2,084	52%	170	1,871	36%
Whinchat	Red	52	883	51	1,892	114%	51	1,012	15%	52	982	11%

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